

NEW UTILITY PATENT APPLICATION TRANSMITTAL

(Large Entity)

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Docket No.
47,958

Total Pages in this Submission
21

TO THE ASSISTANT COMMISSIONER FOR PATENTS

Box Patent Application
Washington, D.C. 20231

Transmitted herewith for filing under 35 U.S.C. 111(a) and 37 C.F.R. 1.53(b) is a new utility patent application for an invention entitled:

Virtual Keyboard

and invented by:

Katsuya Nakagawa

If a CONTINUATION APPLICATION, check appropriate box and supply the requisite information:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: _____

Enclosed are:

Application Elements

1. ☒ Filing fee as calculated and transmitted as described below
2. ☒ Specification having 15 (including cover sheet) pages and including the following:
 - a. ☒ Descriptive Title of the Invention
 - b. ☐ Cross References to Related Applications (if applicable)
 - c. ☐ Statement Regarding Federally-sponsored Research/Development (if applicable)
 - d. ☐ Reference to Microfiche Appendix (if applicable)
 - e. ☒ Background of the Invention
 - f. ☒ Brief Summary of the Invention
 - g. ☒ Brief Description of the Drawings (if drawings filed)
 - h. ☐ Detailed Description
 - i. ☒ Claim(s) as Classified Below
 - j. ☒ Abstract of the Disclosure
3. ☒ Drawing(s) (when necessary as prescribed by 35 USC 113)
 - a. ☒ Formal
 - b. ☐ Informal

Number of Sheets 6

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Application Elements (Continued)

4. ☒ Oath or Declaration
- a. ☐ Newly executed (*original or copy*) ☐ Unexecuted
- b. ☐ Copy from a prior application (37 CFR 1.63(d)) (*for continuation/divisional application only*)
- c. ☒ With Power of Attorney ☐ Without Power of Attorney
5. ☐ Incorporation By Reference (*usable if Box 4b is checked*)
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. ☐ Computer Program in Microfiche (*Appendix*)
7. ☐ Nucleotide and/or Amino Acid Sequence Submission (*if applicable, all must be included*)
- a. ☐ Paper Copy
- b. ☐ Computer Readable Copy (*identical to computer copy*)
- c. ☐ Statement Verifying Identical Paper and Computer Readable Copy

Accompanying Application Parts

8. ☒ Assignment Papers (*cover sheet & document(s)*)
9. ☐ 37 CFR 3.73(B) Statement (*when there is an assignee*)
10. ☐ English Translation Document (*if applicable*)
11. ☐ Information Disclosure Statement/PTO-1449 ☐ Copies of IDS Citations
12. ☐ Preliminary Amendment
13. ☒ Acknowledgment postcard
14. ☒ Certificate of Mailing
- ☐ First Class ☒ Express Mail (*Specify Label No.*): TB553891987US
15. ☒ Certified Copy of Priority Document(s) (*if foreign priority is claimed*)

**NEW UTILITY PATENT APPLICATION TRANSMITTAL
(Large Entity)**

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21

Accompanying Application Parts (Continued)

16. ☐ Additional Enclosures (please identify below):

Fee Calculation and Transmittal

CLAIMS AS FILED

For	#Filed	#Allowed	#Extra	Rate	Fee
Total Claims	2	- 20 =	0	x \$22.00	\$0.00
Indep. Claims	1	- 3 =	0	x \$82.00	\$0.00
Multiple Dependent Claims (check if applicable) <input type="checkbox"/>					\$0.00
BASIC FEE					\$790.00
OTHER FEE (specify purpose) Recordal of Assignment					\$40.00
TOTAL FILING FEE					\$830.00

- ☒ A check in the amount of \$830.00 to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge and credit Deposit Account No. 04-1105 as described below. A duplicate copy of this sheet is enclosed.
- ☐ Charge the amount of as filing fee.
- ☒ Credit any overpayment.
- ☒ Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.
- ☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.311(b).

Dated:

Jan 13, 2011

Signature

David G. Conlin, Esq. (27,026)
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CC:

CERTIFICATE OF MAILING BY "EXPRESS MAIL" (37 CFR 1.10)Applicant(s): **K. Nakagawa**

Docket No.

47,958

Serial No.

not yet assigned

Filing Date

none

Examiner

Group Art Unit

Invention: **Virtual Keyboard**I hereby certify that this **New Utility Patent Application Transmittal (Large Entity)***(Identify type of correspondence)*

is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under
37 CFR 1.10 in an envelope addressed to: The Commissioner of Patents and Trademarks, Washington, D.C.

20231-0001 on

Jan. 13, 1998
*(Date)*KATHY THOMAS*(Typed or Printed Name of Person Mailing Correspondence)*Kathy Thomas*(Signature of Person Mailing Correspondence)***TB553891987US***("Express Mail" Mailing Label Number)***Note: Each paper must have its own certificate of mailing.**

1990-1991		1991-1992		1992-1993		1993-1994		1994-1995		1995-1996		1996-1997		1997-1998		1998-1999		1999-2000		2000-2001		2001-2002		2002-2003		2003-2004		2004-2005		2005-2006		2006-2007		2007-2008		2008-2009		2009-2010		2010-2011		2011-2012		2012-2013		2013-2014		2014-2015		2015-2016		2016-2017		2017-2018		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2023-2024		2024-2025		2025-2026		2026-2027		2027-2028		2028-2029		2029-2030		2030-2031		2031-2032		2032-2033		2033-2034		2034-2035		2035-2036		2036-2037		2037-2038		2038-2039		2039-2040		2040-2041		2041-2042		2042-2043		2043-2044		2044-2045		2045-2046		2046-2047		2047-2048		2048-2049		2049-2050		2050-2051		2051-2052		2052-2053		2053-2054		2054-2055		2055-2056		2056-2057		2057-2058		2058-2059		2059-2060		2060-2061		2061-2062		2062-2063		2063-2064		2064-2065		2065-2066		2066-2067		2067-2068		2068-2069		2069-2070		2070-2071		2071-2072		2072-2073		2073-2074		2074-2075		2075-2076		2076-2077		2077-2078		2078-2079		2079-2080		2080-2081		2081-2082		2082-2083		2083-2084		2084-2085		2085-2086		2086-2087		2087-2088		2088-2089		2089-2090		2090-2091		2091-2092		2092-2093		2093-2094		2094-2095		2095-2096		2096-2097		2097-2098		2098-2099		2099-2100		2100-2101		2101-2102		2102-2103		2103-2104		2104-2105		2105-2106		2106-2107		2107-2108		2108-2109		2109-2110		2110-2111		2111-2112		2112-2113		2113-2114		2114-2115		2115-2116		2116-2117		2117-2118		2118-2119		2119-2120		2120-2121		2121-2122		2122-2123		2123-2124		2124-2125		2125-2126		2126-2127		2127-2128		2128-2129		2129-2130		2130-2131		2131-2132		2132-2133		2133-2134		2134-2135		2135-2136		2136-2137		2137-2138		2138-2139		2139-2140		2140-2141		2141-2142		2142-2143		2143-2144		2144-2145		2145-2146		2146-2147		2147-2148		2148-2149		2149-2150		2150-2151		2151-2152		2152-2153		2153-2154		2154-2155		2155-2156		2156-2157		2157-2158		2158-2159		2159-2160		2160-2161		2161-2162		2162-2163		2163-2164		2164-2165		2165-2166		2166-2167		2167-2168		2168-2169		2169-2170		2170-2171		2171-2172		2172-2173		2173-2174		2174-2175		2175-2176		2176-2177		2177-2178		2178-2179		2179-2180		2180-2181		2181-2182		2182-2183		2183-2184		2184-2185		2185-2186		2186-2187		2187-2188		2188-2189		2189-2190		2190-2191		2191-2192		2192-2193		2193-2194		2194-2195		2195-2196		2196-2197		2197-2198		2198-2199		2199-2200		2200-2201		2201-2202		2202-2203		2203-2204		2204-2205		2205-2206		2206-2207		2207-2208		2208-2209		2209-2210		2210-2211		2211-2212		2212-2213		2213-2214		2214-2215		2215-2216		2216-2217	
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VIRTUAL KEYBOARD

BACKGROUND OF THE INVENTION

The present invention relates to an input device and more particularly to a keyboard displayed on a display screen, which keyboard is hereinafter referred to as virtual keyboard.

On a conventional keyboard, one may input a capital character (alphabet) by pushing down on a Shift-key first and then keeping the shift key in the pushed state, pushing and releasing a desired character key. After this, one releases the shift key.

On the other hand, a virtual keyboard works for determining a character key of a keyboard presented on a display screen by comparing position information received from an output of a transparent pressure (touch)-sensitive panel disposed on the display screen with position information of keys of the keyboard presented on the display screen and outputting a character indicated on a corresponding character key.

Accordingly, on the virtual keyboard, any small character (alphabet) is input by pushing a corresponding key of the keyboard indicated on the display screen and any capital character is input in a shift mode, namely, by pushing a shift key first and a

corresponding character key next. In practice of inputting a capital character (e.g., "I"), one must push and release the shift key to change over the input mode to Capital input mode, must push and release the key <I> to input the character "I" and, then, must push and release the shift key again to release the Capital input mode.

On the above-described virtual keyboard, however, the number of push-and-release operations is larger than by one on the conventional keyboard. This is inconvenient and unpleasant for those who have been familiar to the conventional keyboard.

SUMMARY OF THE INVENTION

Main object of the present invention is to provide a virtual keyboard which can be used like a conventional keyboard, allowing a user natural inputting operation with a reduced operation load.

A virtual keyboard according to the present invention is featured in that it is composed of a display means for displaying a keyboard, a transparent pressure(touch)-sensitive panel disposed on the display means and a processing means for receiving information of positions detected and sent in a time sequence from the pressure(touch)-sensitive panel when a combination

of a general key and a special key in the keyboard is pushed at a time, identifying a position of the pushed general key according to the received position information and outputting a code corresponding to the pushed combination of the special key and the general key.

Another virtual keyboard according to the present invention has the same construction as the above-mentioned virtual keyboard and is further featured in that one of the received position information is a middle position between the pushed positions being selected as a furthest position from the special key in the information of positions detected in a time sequence and the position of the general key is determined by doubling a distance from the special key to the furthest position.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a structure of a pressure-sensitive panel.

Fig. 2A shows an equivalent circuit for detecting a position in the X-axis direction when a push is made at one point on a pressure-sensitive panel.

Fig. 2B shows an equivalent circuit for detecting a position in the Y-axis direction when a push is made at

one point on a pressure-sensitive panel.

Fig. 3 shows an equivalent circuit for detecting a position in the X-axis direction when two points on a pressure-sensitive panel are pushed at a time.

Fig. 4 shows a basic construction of an embodiment of the present invention.

Fig. 5 is a view for explaining an input processing action of an embodiment of the present invention.

Fig. 6 is a flow chart depicting the operation of an embodiment of the present invention.

Fig. 7 is illustrative of an aspect of the present invention when it is applied to a portable type information terminal.

PREFERRED EMBODIMENTS OF THE INVENTION

A pressure(touch)-sensitive panel used in a virtual keyboard of the present invention is similar in structure to a prior art pressure-sensitive panel and will be first and briefly described below:

Fig. 1 shows, by way of example, a film resistance type analog pressure-sensitive panel which comprises a large number, from several hundreds to several thousands, of transparent resistance wires 10 densely arranged along the X-axis and Y-axis thereof respectively and two pair of electrodes 11 for

generating an output when any area of the pressure-sensitive touch panel is pushed down there on.

Referring to Fig. 2, the operation principle of the pressure-sensitive panel is described below:

When a pressure was applied to a point 20 on the pressure-sensitive panel, two resistance wires in the X-direction and Y-direction conduct at the point 20 as shown in Fig. 2A. At this time, a voltage V_0 is applied across terminal electrode pair in the X-axis direction, so an output of $V_0 \cdot R_{X2} / (R_{X1} + R_{X2})$ is obtained across terminal electrode pair at both ends of the wire in the Y-axis direction. The output value corresponding to a divided resistance is amplified to determine a position of the point 20 in the X-axis direction. Similarly, a position of the point 20 in the Y-axis direction is determined by applying a voltage V_0 across terminal electrode pair in the direction Y as shown in Fig. 2B. Usually, the pressure-sensitive panel conducts sampling of position values of a point pushed down on in the X-direction and Y-direction by momentarily changing the state of Fig. 2A to the state of Fig. 2B and reverse.

Fig. 3 shows the pressure-sensitive panel when detecting positions of two points pushed down thereon in the X-axis direction. As shown in Fig. 3, a voltage obtained across electrodes in the Y-axis direction is

keyboard and has alphabetical character keys each of which carries thereon a small and a capital character as shown in an enlarged view in Fig. 4. The pressure-sensitive panel 3 is the before-described type pressure-sensitive panel.

The computing portion 4 holds coordinate areas corresponding to areas of respective keys of the keyboard image 2 in a coordinate system of the pressure-sensitive panel. Namely, the computing portion 4 has a memory (not shown) in which coordinate data of respective unit areas (keys of the keyboard image 2) in the coordinate pressure-sensitive panel and codes corresponding to said coordinate data. When any key of the keyboard image 2 was pushed, the computing portion 4 detects the pushed position by sampling outputs of the pressure-sensitive panel 3, identifies the pushed key by comparing the detected position with stored coordinate data and generates the corresponding code.

Referring to Fig. 5, the operation of a virtual keyboard according to the present invention will be described bellow:

In Fig. 5, there is shown ANK (alphabetical character and numeral etc.) key 51 of the keyboard image 2 that is hereinafter referred to as a general key. When any general key was pushed down on, the

computing portion 4 conducts the above-mentioned operations and generates a corresponding code. In practice, a user can input, e.g., a small alphabetical letter "i" by pushing down on a general key 51 indicated with a letter "i". In this case, the small letter "i" is generated as far as the detected position lies within a coordinate area of the general key 51. This operation is the same as that of the conventional keyboard.

The operation of the virtual keyboard when detected that a general key and a special key (e.g., a shift-key, control-key or front-key) are pushed at a time is as follows:

When a user wants to input a capital alphabetical letter, e.g., "I", he or she pushes a special (<shift>) key 52 and pushes, keeping the shift key as pushed, a general (<I>) key 51 (the same key used for inputting a small letter "i"). In this instance, the computing portion 4 detects that two keys were pushed at a time, specifies the position of the pushed general key 51 by conducting processing operations (to be described later), judges that the capital letter "I" was input in this case, and generates a corresponding code. The computing portion 4, of course, has in its memory coordinate-data of areas of two simultaneously pushed keys and corresponding codes.

In this case, a user pushes a position 53 in a coordinate area of the special (<shift>) key 52 and, keeping the special key in the pushed state, pushes a position 54 in a coordinate area of the general character <i> key 51, then releases the push from the position 54 (general key 51) and the position 53 (special key 52). Output of the pressure-sensitive panel is sampled at a frequency of 100 to 200 times per second. Consequently, information of the detected positions represents a trace 56 which starts from a position 53, reaches a position 55 being a middle point between the start position 53 and the position 54 and returns therefrom to the start position 53. The position 53 is fixed by the coordinate (X1, Y1) and the position 55 is fixed by the coordinate (X2, Y2). The computing portion 4 detects these coordinates and calculates the coordinate (Xn, Yn) of the position 54 according to the following equations:

$$Xn = 2X2 - X1$$

$$Yn = 2Y2 - Y1$$

Namely, it is determined that the capital letter "I" was input, if the calculated coordinate (Xn, Yn) is within a coordinate area of a general key 51.

Thus, pushing a special key first and a general key next generates a trace of pushed positions, which starts from a coordinate area of the special key, turns

at a certain point and terminates in the same coordinate area of the same special key. Consequently, the position of the general key pushed together with the special key can be determined by calculating a doubled vector from the start point to the turning point (a middle position between pushed positions). The inputting operation can be thus performed just like on the conventional keyboard. The display means may display character corresponding to a code generated.

Referring to Fig. 6, the inputting operation of the virtual keyboard is described as follows:

A pushed position is detected first from the output of the pressure-sensitive panel (Step 1). Next, the detected position is judged whether it lies within an area of general keys. If so, a corresponding character is generated (Step 2 and 3).

The detected position being outside the area of general keys is further checked whether it lies within an area of special keys (Step 4). Nothing is done if the position is outside the area of the special keys (Step 5). If the detected position exists within the area of special keys, a trace of subsequently outputted position information (in the unstable state) is calculated and a turning point of the trace (a middle position between the pushed positions, in a sense) is determined (Step 6). In this embodiment, a furthest of

[illegible]

CLAIMS

1. A virtual keyboard comprising a displays for displaying a keyboard, a transparent pressure-sensitive panel disposed on the displays and a processor for receiving information of positions detected and sent in a time sequence from the pressure-sensitive panel when a combination of a general key and a special key in the keyboard is pushed at a time, identifying a position of the pushed general key according to the received position information and outputting a code corresponding to the pushed combination of the special key and the general key.

2. A virtual keyboard as defined in claim 1, wherein one of the received position information is a middle position between the pushed positions being selected as a furthest position from the special key in the information of positions detected in a time sequence and the position of the general key is determined by doubling a distance from the special key to the furthest position.

ABSTRACT

The present invention provides virtual keyboard which can be used at the same number of operations as on a conventional keyboard and can allow a natural input operation at a minimized load. The virtual keyboard comprises a liquid crystal display for displaying thereon a keyboard having special keys and general keys, a transparent pressure-sensitive panel superimposed on the display and a computing portion that, when a special key and a general key on a pressure-sensitive panel are pushed at a time, detects the coordinate of a middle point between the two pushed positions from outputs of the pressure-sensitive panel, calculates a general key position from the special key point and the middle point and outputs a code corresponding to that position.

[illegible]

Prior U.S. Applications or PCT International Applications Designating the U.S-Benefit Under 35 U.S.C. §120					
U.S. Applications			Status (Check One)		
Application Serial No.	U.S. Filing Date		Patented	Pending	Abandoned
PCT Applications Designating the U.S.					
Application No.	Filing Date	U.S. Serial No. Assigned			

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below:

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) with full powers of association, substitution and revocation to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

David S. Resnick (Reg. No. 34,235)
Peter F. Corless (Reg. No. 33,860)

2 0 1	FULL NAME OF INVENTOR	LAST NAME NAKAGAWA	FIRST NAME Katsuya	MIDDLE NAME
	RESIDENCE & CITIZENSHIP	CITY Nara-shi	STATE OR FOREIGN COUNTRY NARA, JAPAN	COUNTRY OF CITIZENSHIP JAPAN
	POST OFFICE ADDRESS	POST OFFICE ADDRESS 45-3 Takama-cho	CITY Nara-shi	STATE OR COUNTRY AND ZIP CODE NARA, JAPAN, 630

2 0 2	FULL NAME OF INVENTOR	LAST NAME	FIRST NAME	MIDDLE NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
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2 0 3	FULL NAME OF INVENTOR	LAST NAME	FIRST NAME	MIDDLE NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
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	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
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2 0 5	FULL NAME OF INVENTOR	LAST NAME	FIRST NAME	MIDDLE NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE OR COUNTRY AND ZIP CODE

2 0 6	FULL NAME OF INVENTOR	LAST NAME	FIRST NAME	MIDDLE NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE OR COUNTRY AND ZIP CODE

2 0 7	FULL NAME OF INVENTOR	LAST NAME	FIRST NAME	MIDDLE NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE OR COUNTRY AND ZIP CODE

2 0 8	FULL NAME OF INVENTOR	LAST NAME	FIRST NAME	MIDDLE NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE OR COUNTRY AND ZIP CODE

I hereby further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Signature of Inventor 201 <i>Katsuya Nakagawa</i>	Signature of Inventor 202
Date: <i>4th, Dec, 1997</i> <i>20th, February, 1997</i>	Date:

#

SECRET-9990000

FIG.1

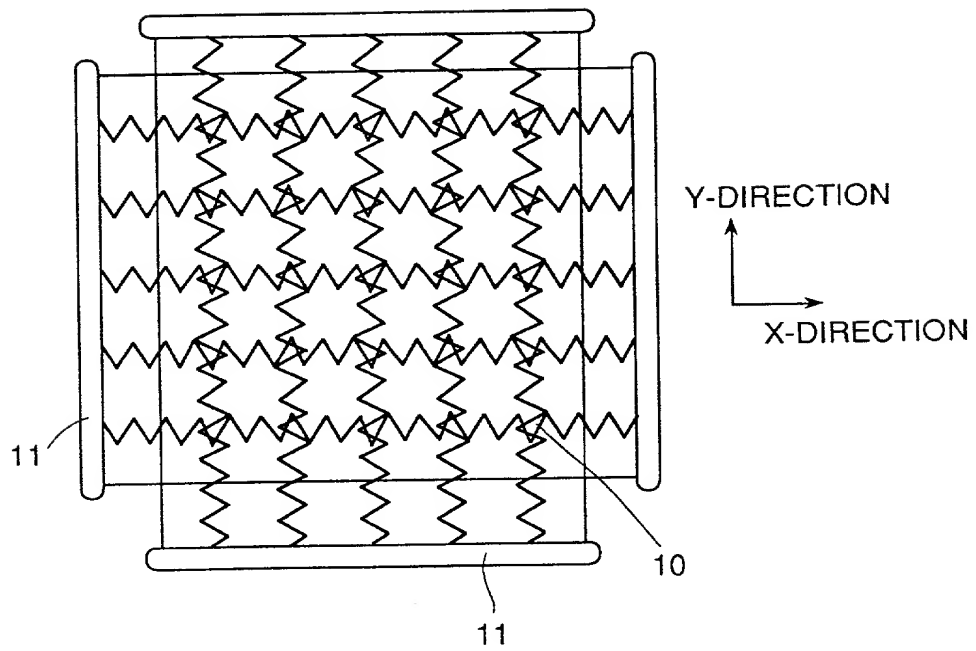


FIG.2A

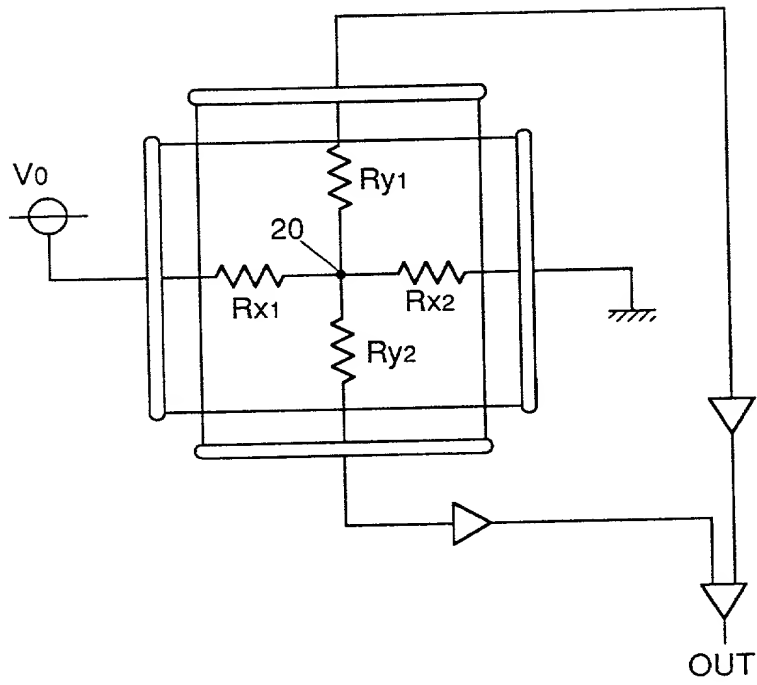


FIG.2B

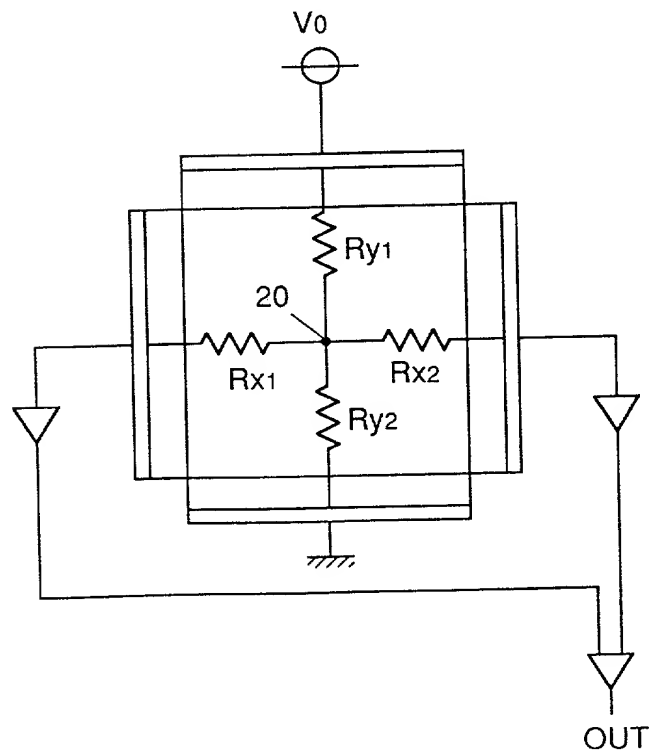


FIG.3

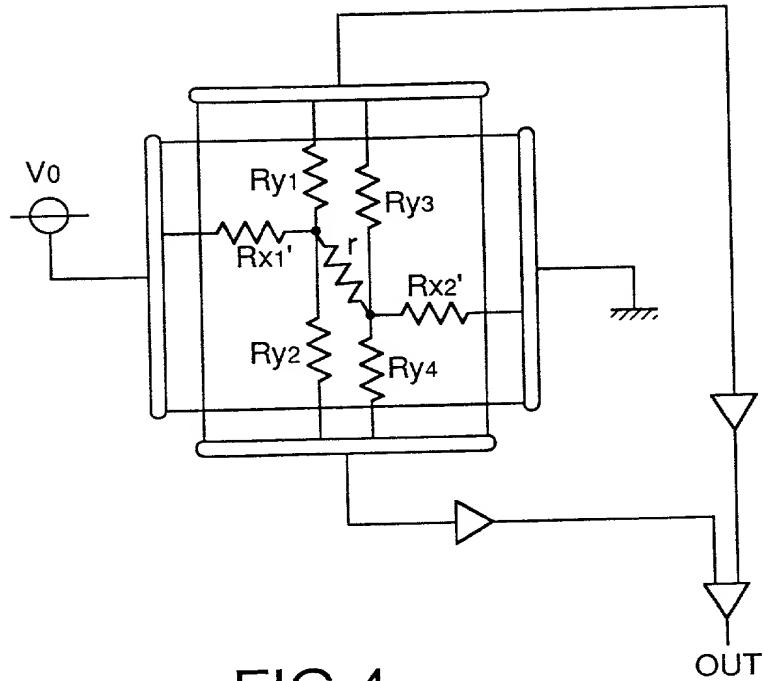


FIG.4

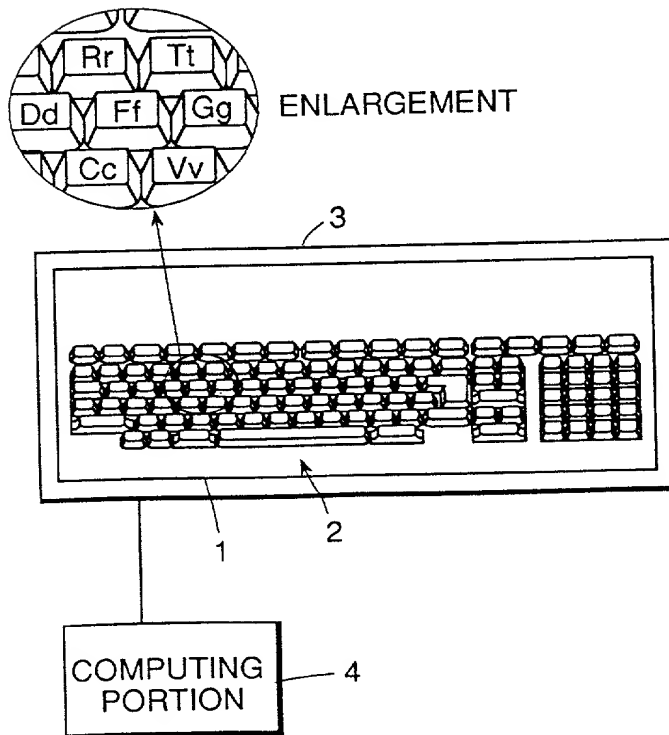


FIG.5

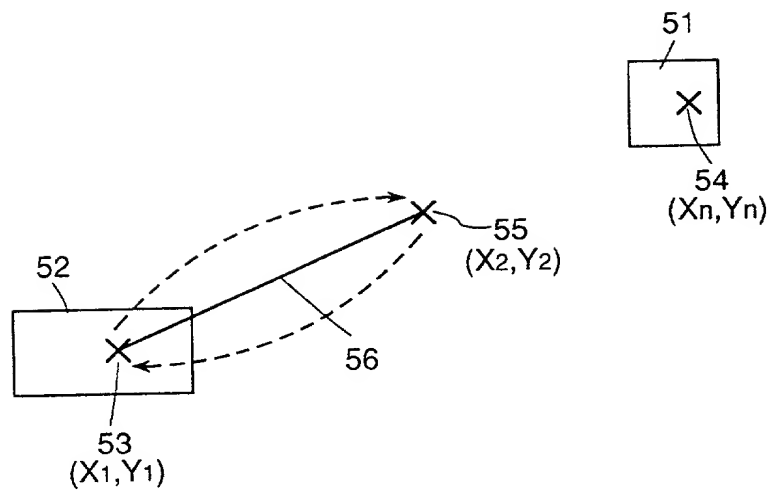


FIG.6

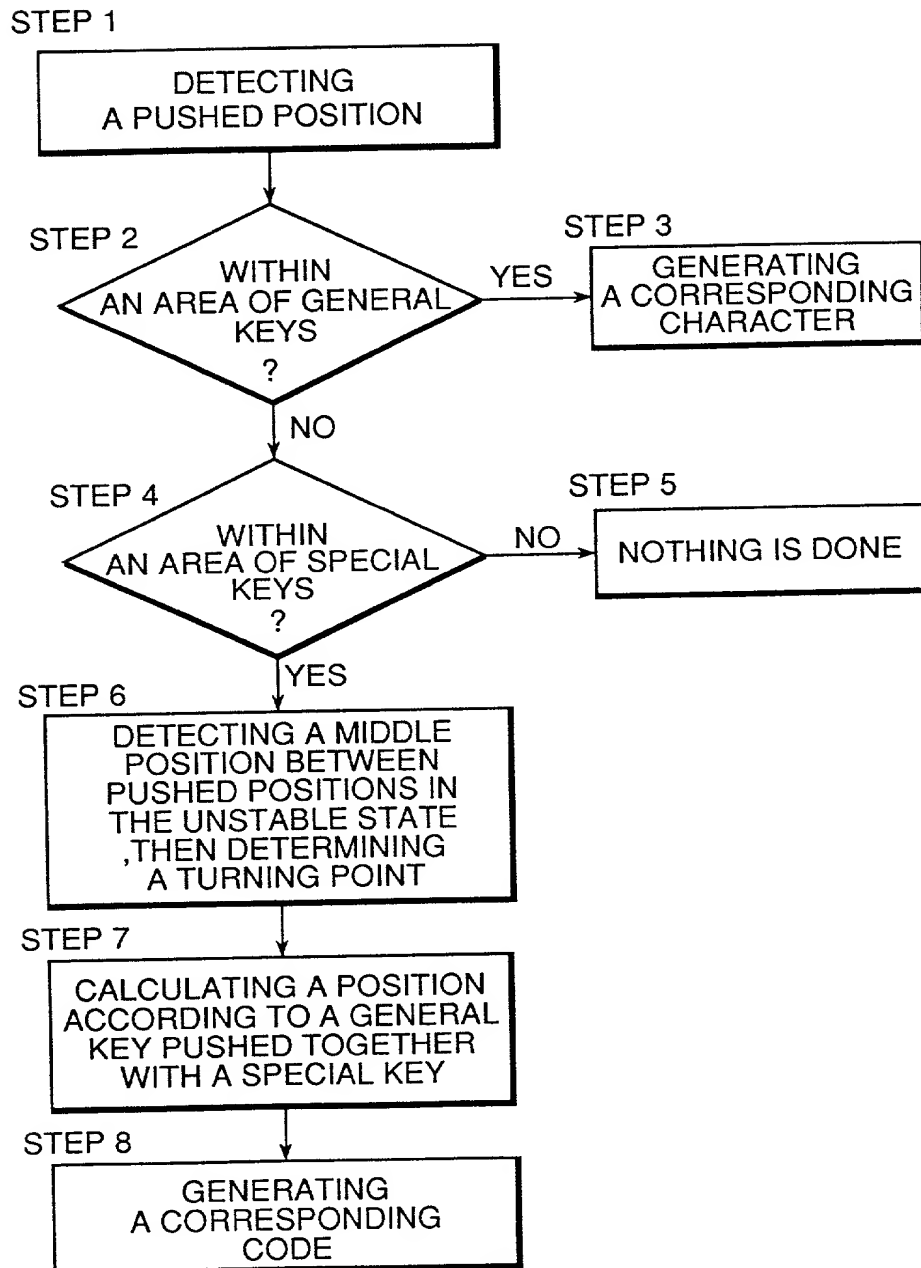


FIG.7

